What is claimed:

1. A *Helicobacter pylori* binding substance comprising a hydrophilic oligosaccharide sequence according to Formula 1

$R_1Gal\beta4GlcNAc\beta3\{(R_2Gal\beta4GlcNAc\beta6)\}_{s1}Gal\{\beta4Glc[NAc]_{s3}\}_{s4}$

wherein R1 and R2 are terminal mono-or oligosaccharides substituents so that at least one of the substituents is NeuNAcα3; s1, s3 and s4 are independently integers 0 or 1 indicating presence or absence of the structure in {} or in [];

as a non-reducing end terminal sequence, and *Helicobacter pylori* binding analogs and derivatives thereof, for use as a medicament.

2. The substance according to claim 1, wherein said oligosaccharide sequence is linked to an aglykon.

3. The substance according to claim 2, wherein said aglykon comprises less than 23 carbon atoms.

4. The substance according to claim 2, wherein said aglykon is a spacer between the oligosaccharide sequence and an oligo- or polyvalent carrier.

5. The substance according to claim 1, wherein said substance is an oligosaccharide or a mixture of oligosaccharides.

6. The substance according to claim 1, wherein R1 or R2, when not being NeuNAcα3, indicates terminal substituents linked to position 2 and/or 3 of the terminal Gal according to Formula 2

$Hex[NAc]_{t1}\alpha/\beta3[(DeoxyHex\alpha2)]_{t2}$

wherein Hex is preferably Gal or Glc, integers t1 and t2 are independently 0 or 1 and α/β means that the linkage is either α or β.

7. The substance according to claim 6, wherein non-sialylated R1 or R2 is a structure selected from the group consisisting of Galα3, GalNAcα3, Fucα2, Galα3(Fucα2), GalNAcα3(Fucα2), Galβ4GlcNAcβ3, GlcNAcβ3Galβ4GlcNAcβ3,

Galβ4GlcNAcβ3Galβ4GlcNAcβ3, GlcNAcα3, GlcNAcβ3, GalNAcβ3, Galβ3, Glcβ3,and Glcα3.

8. The substance according to claim 6, wherein non-sialylated R1 or R2 is a structure selected from the group consisisting of blood group antigen type structures: Galα3, GalNAcα3, Fucα2, Galα3(Fucα2), and GalNAcα3(Fucα2).

9. The substance according to claim 1, wherein said substance is

NeuNAcα3LacNAcβ3(NeuNAcα3LacNAcβ6)LacNAcβ3LacNAc,
NeuNAcα3LacNAcβ3(NeuNAcα3LacNAcβ3LacNAcβ6)LacNAc,
NeuNAcα3LacNAcβ3LacNAcβ3(NeuNAcα3LacNAcβ6)LacNAc,
NeuNAcα3LacNAcβ3(NeuNAcα3LacNAcβ6)LacNAcβ3Lac,
NeuNAcα3LacNAcβ3(NeuNAcα3LacNAcβ6)LacNAcβ3Gal,
NeuNAcα3LacNAcβ3(NeuNAcα3LacNAcβ6)Lac,
NeuNAcα3LacNAcβ3(NeuNAcα3LacNAcβ6)LacNAc, or
NeuNAcα3LacNAcβ3(NeuNAcα3LacNAcβ6)Gal

10. The substance according to claim 1, wherein the oligosaccharide sequences comprise further poly-N-acetyllactosamine branches.

11. The substance according to claim 10 having the structure

NeuNAcα3LacNAcβ3(NeuNAcα3LacNAcβ6)LacNAcβ3(NeuNAcα3LacNAcβ6)LacNAc

wherein LacNAc indicates N-acetyllactosamine, Galβ4GlcNAc, and Lac is lactose, Galβ4Glc.

12. The substance according to claim 1, wherein s1 is 0 and said substance is

NeuNAcα3LacNAcβ3LacNAcβ3LacNAc,
NeuNAcα3LacNAcβ3LacNAcβ3Lac,
NeuNAcα3LacNAcβ3LacNAcβ3Gal,
NeuNAcα3LacNAcβ3LacNAc,
NeuNAcα3LacNAcβ3Lac, or
NeuNAcα3LacNAcβ3Gal

13. The substance according to claim 1, wherein at least one of N-acetylactosamine residues have been replaced by type 2 N-acetyllactosamine analogous structure or structures, preferably by lactose residues according to Formula 3

$R_1Gal\beta4Glc[NAc]_{u1}\beta3\{(R_2Gal\beta4Glc[NAc]_{u2}\beta6)\}_{s1}Gal\{\beta4Glc[NAc]_{u3}\beta3Gal\}_{s2}\{\beta4Glc[NAc]_{s3}\}_{s4}$

wherein R1 and R2 are independently nothing or terminal mono-or oligosaccharides substituents with the proviso that at least one of the substituents is NeuNAcα3 or $NeuNAc\alpha3Gal\beta4Glc[NAc]_{u4}\beta3$; integers s1, s2, s3 and s4 are independently 0 or 1, indicating the presence or absence of the structures in [] or in {}; integers u1, u2, u3, and u4 are independently 0 or 1 indicating the presence of absence of the N-acetyl groups in the non-reducing end terminal or midchain lactosamine residues with the proviso that at least one of the integers present is 0.

14. The substance according to claim 13, wherein said substance is:

$NeuNAc\alpha3Lac[NAc]_{u1}\beta3(NeuNAc\alpha3Lac[NAc]_{u2}\beta6)Lac[NAc]_{u3}\beta3Gal\{\beta4Glc[NAc]_{s3}\}_{s4}$
$NeuNAc\alpha3Lac[NAc]_{u1}\beta3(NeuNAc\alpha3Lac[NAc]_{u2}\beta3Lac[NAc]_{u3}\beta6)Gal\{\beta4Glc[NAc]_{s3}\}_{s4}$
$NeuNAc\alpha3Lac[NAc]_{u1}\beta3Lac[NAc]_{u2}\beta3(NeuNAc\alpha3Lac[NAc]_{u3}\beta6)Gal\{\beta4Glc[NAc]_{s3}\}_{s4}$
$NeuNAc\alpha3Lac[NAc]_{u1}\beta3Lac[NAc]_{u2}\beta3Gal\{\beta4Glc[NAc]_{s3}\}_{s4}$ or
$NeuNAc\alpha3Lac[NAc]_{u1}\beta3Lac[NAc]_{u2}$

15. The substance according to claim 1, wherein said substance is further fucosylated according to the formula 4

$R_1Gal\beta4[(Fuc\alpha3)]_{t1}Glc[NAc]_{u1}\beta3\{(R_2Gal\beta4[(Fuc\alpha3)]_{t2}Glc[NAc]_{u2}\beta6)\}_{s1}Gal[\beta4[(Fuc\alpha3)]_{t3}Glc[NAc]_{u3}\beta3Gal]_{s2}\{\beta4[(Fuc\alpha3)]_{t4}Glc[NAc]_{s3}\}_{s4}$

wherein R1 and R2 are independently nothing or terminal mono-or oligosaccharides substituents with the proviso that at least one of the substituents is NeuNAcα3 or $NeuNAc\alpha3Gal\beta4[(Fuc\alpha3)]_{t5}Glc\ [NAc]_{u4}\beta3$; integers s1, s2, s3, and s4 are independently 0 or 1 indicating the presence or absence of the structures in [] or in {}; integers u1, u2, u3, and u4 are independently 0 or 1 indicating the presence of absence of the N-acetyl groups in the non-reducing end terminal or midchain

lactosamine residues with the proviso that at least one of the integers present is 0; integers t1, t2, t3, t4 and t5 are independently 0 or 1 indicating the presence or absence of the Fucα3-branch-structures in [] so that at least t1, t2, t3, t4 or t5 is 1.

16. The substance according to claim 1, wherein said substance comprises an oligosaccharide sequence according to Formula 5

NeuNAcα3Galβ4GlcNAcβ3Gal

17. The substance according to claim 1, wherein said substance comprises an oligosaccharide sequence according to Formula 6

NeuNAcα3Galβ4GlcNAcβ3Galβ4Glc(NAc)$_m$

wherein m is 0 or 1.

18. The substance according to claim 16 or 17, wherein the oligosaccharide sequence is no pentasaccharide glycolipid NeuNAcα3Galβ4GlcNAcβ3Galβ4GlcβCer.

19. The substance according to claim 16 or 17, wherein the oligosaccharide sequence is no linked to ceramide or a hydrophobic aglycon or spacer comprising more than 22 carbon atoms.

20. The substance according to claim 16 or 17, wherein the tetrasaccharide sequence is coupled to an aglycon or spacer comprising less than 8 carbon atoms in a hydrophobic structure.

21. The substance according to any one of claims 1-20, wherein said substance is conjugated to a polysaccharide, preferably to a polylactosamine chain or a conjugate thereof.

22. The substance according to any one of claims 1-20, wherein said substance is a glycolipid.

23. The substance according to any one of claims 1-20, wherein said substance is an oligomeric molecule containing at least two or three oligosaccharide chains.

24. The substance according to any one of claims 1-20, wherein said substance consists of a micelle comprising one or more of the substances as defined in claims 1 – 20.

25. The substance according to any one of claims 1 – 24, wherein said substance(s) is/are conjugated to a carrier.

26. The substance according to any one of claims 1 - 20, wherein said substance is covalently conjugated with an antibiotic effective against *Helicobacter pylori*, preferably a penicillin type antibiotic.

27. The substance according to claim 25, wherein position C1 of reducing end terminal Gal, Glc or GlcNAc of said oligosaccharide sequence (OS) is oxygen linked (–O–) to an oligovalent or a polyvalent carrier (Z), via a spacer group (Y) and optionally via a monosaccharide or oligosaccharide residue or derivative (X), forming the following structure

$$[OS\text{–}O\text{–}(X)_n\text{–}Y]_m\text{–}Z$$

where integers m, and n have values $m \geq 1$, and n is independently 0 or 1; X is preferably lactosyl-, galactosyl-, poly-N-acetyl-lactosaminyl, or part of an O-glycan or an N-glycan oligosaccharide sequence, Y is a spacer group or a terminal conjugate such as a ceramide lipid moiety or a linkage to Z;

or a derivative of the substance of said structure having binding activity to *Helicobacter pylori*.

28. A pharmaceutical composition comprising a substance of any one of claims 1-26 for the treatment or prophylaxis of any condition due to the presence of *Helicobacter pylori*.

29. A pharmaceutical composition according claim 28, wherein said pharmaceutical composition is for the treatment of chronic superficial gastritis, gastric ulcer, duodenal ulcer, gastric adenocarcinoma, non-Hodgkin lymphoma in human stomach, liver disease, pancreatic disease, skin disease, heart disease, or autoimmune diseases including autoimmune gastritis and pernicious anaemia and non-steroid anti-inflammatory drug (NSAID) related gastric disease, or for prevention of sudden infant death syndrome.

30. Use of the substance as defined in claims 1 - 27 for the production of a pharmaceutical or nutritional composition for the treatment or prophylaxis of any condition due to the presence of *Helicobacter pylori*.

31. Use of the substance as defined in claims 1 - 27, for the diagnosis of a condition due to infection by *Helicobacter pylori*.

32. A nutritional additive, food-stuff or beverage containing the composition or substance according to any one of claims 1 – 27.

33. The nutritional additive according to claim 32 for use in infant food.

34. A method for the treatment of a condition due to presence of *Helicobacter pylori*, wherein a pharmaceutically effective amount of the substance as defined in any one of claims 1 – 27 is administered to a subject in need of such treatment.

35. The method according to claim 34, when said condition is caused by the presence of *Helicobacter pylori* in the gastrointestinal tract of a patient.

36. The method according to claim 34 for the treatment of chronic superficial gastritis, gastric ulcer, duodenal ulcer, gastric adenocarcinoma, non-Hodgkin lymphoma in human stomach, liver disease, pancreatic disease, skin disease, heart disease, or autoimmune diseases including autoimmune gastritis and pernicious anaemia and non-steroid anti-inflammatory drug (NSAID) related gastric disease, or for prevention of sudden infant death syndrome.

37. The method of treatment according to any one of claims 34 – 36, wherein said substance is a nutritional additive or a part of a nutritional composition.

38. The composition or substance according to any one of claims 1 – 27 for binding or inhibition of *Helicobacter pylori*.

39. Use of the substance as defined in claims 1 - 27 for the production of a nutritional additive or composition for the treatment or prophylaxis of any condition due to the presence of *Helicobacter pylori*.

40. The use according to claim 39 wherein said nutritional additive or composition is for infant food.

41. Use of the substance as defined in claims 1 – 27, for the identification of bacterial adhesin.

42. Use of the substance as defined in claims 1 – 27 or a substance identified according to claim 38, for the production of a vaccine against *Helicobacter pylori*.

43. Use of the substance as defined in claims 1 – 27 for typing *Helicobacter pylori*.

44. Use of the substance as defined in claims 1 – 27 for *Helicobacter pylori* binding assays.

45. The *Helicobacter pylori* binding non-acidic polyvalent substance according to claim 27, wherein linker structure Y is

$[OS\text{-}O\text{-}(X)_n\text{-}L_1\text{-}CH(H/\{CH_{1\text{-}2}OH\}_{p1})\text{-}\{CH_1OH\}_{p2}\text{-}\{CH(NH\text{-}R)\}_{p3}\text{-}\{CH_1OH\}_{p4}\text{-}L_2]_m\text{-}Z$

wherein L_1 and L_2 are linking groups comprising independently oxygen, nitrogen, sulphur or carbon linkage atom or two linking atoms of the group forming linkages such as –O-, -S-, $-CH_2-$, -N-, -N(COCH3)-, amide groups –CO-NH- or –NH-CO- or –N-N- (hydrazine derivative) or an amino oxy-linkages –O-N- and –N-O-; L1 is linkage from carbon 1 of the reducing end monosaccharide of X or when n =0, L1 replaces –O- and links directly from the reducing end C1 of OS; p1, p2, p3, and p4 are independently integers from 0-7, with the proviso that at least one of p1, p2, p3, and p4 is at least 1; $CH_{1\text{-}2}OH$ in the branching term $\{CH_{1\text{-}2}OH\}_{p1}$ means that the chain terminating group is CH_2OH and when the p1 is more than 1 there is secondary alcohol groups –CHOH- linking the terminating group to the rest of the spacer; R is preferably acetyl group ($-COCH_3$) or R is an alternative linkage to Z and then L_2 is one or two atom chain terminating group, in another embodiment R is an analog forming group comprising $C_{1\text{-}4}$ acyl group comprising amido structure or H or $C_{1\text{-}4}$ alkyl forming an amine; and m > 1 and Z is polyvalent carrier; OS and X are as defined in claim 16.

46. A *Helicobacter pylori* binding substance comprising a sialic acid derivative as a non-reducing end terminal sequence with binding affinity towards *Helicobacter pylori* having the structure

SA(X-R)

wherein X is a linking atom or group bound to C1 of sialic acid, R is H or an organic radical comprising more than 3 carbon atoms; X is preferably -NH forming amide structure with the carboxylic acid group of the sialic acid residue; R is preferably H or a C_4- C_{30} organic radical comprising a ring structure and/or an aliphatic chain; R is more preferably a C_6-C_{24} organic radical and most preferably R is a C6-24 aliphatic alkyl chain

47. The substance according to claim 46, wherein said sialic acid is NeuNAc.

48. The substance according to claim 46, wherein said sialic acid is α3-linked to type two N-acetyllactosamine sequence having the structure

$SA(X\text{-}R)\alpha xGal\{\beta 4GlcNAc[\beta 3Gal(\beta 4Glc)_{p1}]_{p2}\}_{p3}$

wherein x is linkage position of the sialic acid derivative and integers p1, p2 and p3 are independently 0 or1 indicating the presence or absence of the whole structure in { }, [ ] or ( ).

49. The substance according to any one of claims 46-48 for use as a medicament.

50. The substance as defined in claims 13-15.

51. A soluble polyvalent substance comprising at least two oligosaccharide sequences sequences from different groups defined in any of the claims 1-27 or 46-48.

52. A food preservative comprising at least one oligosaccharide sequences defined in any of the claims 1-27 or 46-48.

53. A mouth hygiene product comprising at least one oligosaccharide sequence defined in any of the claims 1-27 or 46-48.

54. A mouth hygiene product according to the claim 53 when the product is selected from group consisting of: tooth pastes, mouth wash solutions, tablets, and chewing gums.

55. A topical, washing or cosmetic product comprising at least one of the oligosaccharide sequences defined in any of the claims 1-27 or 46-48.

56. A topical, washing or cosmetic product according to the claim 55 when the product is selected from the group consisting of: tooth pastes, mouth wash solutions, tablets, cleanser, disinfectant and chewing gums.

57. Use of a composition defined in any of the claims 1-27 or 46-48 for non-diagnostic inhibition or agglutination of pathogen *ex vivo*.

58. Use according to claim 57 when the pathogen is *H. pylori*.

59. The method for remodelling natural food material involving the following steps:
1) releasing saccharides from the material chemically or enzymatically,
2) isolating a crude oligosaccharides fraction optionally enriched with desired saccharides which are preferably poly-N-acetyllactosamines,
3) releasing the terminal monosaccharides, preferably fucose and/or sialic acid, more preferably sialic acid, preferably the release is performed by mild acid treatment and
4) transferring a monosaccharide, preferably α3-linked sialic acid, to oligosaccharide by a glycosyltransferase or transsialidase enzyme.